REMARKS

Claims 38-52 remain pending in the application.

The specification is amended to correct several typographical errors recently discovered by the Applicant.

The pending claims stand rejected as being unpatentable over Hunt (5,836,506) in view of Fukasawa (4,842,706) (claims 38-43), and further in view of Hunt (6,073,830) (claims 44-52). Applicant requests reconsideration of such rejections.

Referring first to claim 38, such recites a physical vapor deposition target construction comprising a physical vapor deposition target consisting essentially of high purity aluminum material diffusion bonded to an aluminum-containing backing plate, wherein a predominant portion of the grains of the target material are less than 100 microns in maximum dimension.

Claim 38 is believed allowable over the Examiner's cited references for at least the reason that the references do not suggest or disclose all of the recited feature of claim 38. Specifically, the references do not suggest or disclose the claim 38 recited high purity aluminum target in which the predominant portion of the grains are less than 100 microns in maximum dimension even though the target is diffusion bonded to an aluminum-comprising backing plate. Applicant's specification emphasizes at, for example, page 5, line 17 through page 6, line 7 that one of the motivations for applicant's invention was a recognition that it would be desirable to develop methods for diffusion bonding an aluminum-containing target to an aluminum-containing backing plate while achieving relatively small grain sizes in the target material. The specification goes on to state that a difficulty associated with diffusion bonding of aluminum-containing targets to aluminum-

containing backing plates is that the diffusion bonding temperatures can cause growth of crystalline grains in the aluminum targets.

The Examiner cites Hunt (506) to show that it is known in the art to diffusion bond aluminum-comprising targets to aluminum-comprising backing plates, and cites Fukasawa to show an aluminum-comprising target having very fine grain sizes (with the average grain sizes of Fukasawa being between one micrometer and one millimeter). The Examiner notes that Hunt does not disclose the grain sizes of the aluminum target material after the diffusion bonding described therein, but contends that it would be obvious to incorporate the small grain sizes of Fukasawa into the materials of Hunt. The Examiner is mistaken. Notably, the target materials of Fukasawa are "single blocks", rather than being bonded to a backing plate. The utilization of the single blocks in Fukasawa negates the problem described in applicant's specification whereby crystalline grains grow to undesirably large sizes during diffusion bonding processes. Nothing in Fukasawa suggests that the small grain sizes described therein could be retained if the target materials were diffusion bonded to a backing plate. The Examiner does, however, correctly note that Fukasawa teaches several advantages for utilizing small grain sizes in target materials. There has been a recognized desire in the industry to form small grain sizes in target materials, and Fukasawa is affirming the motivation described in applicant's specification that there is significant benefit to be gained if the grain sizes within a target material can be reduced. Accordingly, Fukasawa evidences the patentability of applicant's improved target construction in which a grain size of a diffusion-bonded aluminum target is reduced relative to prior art diffusion-bonded aluminum targets.

As mentioned above, nothing in Hunt suggests that the grain sizes of the aluminum target materials disclosed therein were small after a diffusion-bonding process. Although applicant's claims are directed toward constructions, rather than methods, a comparison of applicant's methods relative to those of Hunt may be useful to the Examiner in understanding why the small grain size recited in claim 38 is not suggested by Hunt, and is a significant improvement relative to the grain size that would be expected from the Hunt process. Accordingly, a brief comparison of applicant's method and the method of Hunt is provided herein.

The Examiner is initially referred to page 6, line 8 through page 7, line 6 of applicant's specification. Such portion of the specification indicates that applicant's invention encompasses methodology for controlling grain growth associated with diffusion bonding of aluminum, and goes on to describe an initial step of applicant's process comprising work hardening of a target material. Specifically, the material is subjected to a compression of at least 60%, and in particular aspects is subjected to a 95% compression or even a 98% compression.

After the target has been subjected to the above-described work hardening, it is diffusion bonded to a backing plate through the process described at page 8, line 9 through page 12, line 10 of applicant's disclosure.

In contrast to applicant's method, Hunt does not disclose or suggest the utilization of work hardening of an aluminum-comprising target prior to the diffusion bonding. The utilization of a work hardening step prior to diffusion bonding is a significant departure of applicant's invention from the prior art methodologies, such as, for example, the methodology described in Hunt. Because applicant's process is significantly different than

the prior art processes, applicant is able to achieve grain sizes substantially smaller in diffusion bonded aluminum-comprising targets than could be achieved by prior art processes. Thus, the small grain sizes recited in claim 38 (i.e., the recitation that a predominant portion of the grains in the recited target material are less than 100 microns in maximum dimension) is not disclosed or suggested by Hunt. Further, there is no suggestion or disclosure in the prior art that the materials of Fukasawa would retain a small grain size when subjected to the processing of Hunt. Accordingly there is no suggestion within the combined references of Hunt and Fukasawa of the claim 38 recited target material in which a dominant portion of the grains is less than 100 microns in maximum dimension in a <u>diffusion bonding construction</u>.

Applicant believes that the above discussion of differences in the methodology of applicant's invention relative to the methodology of Hunt can shed some light on the allowability of applicant's claim 38 relative to the Examiner's cited references. It is to be understood, however, that the constructions recited in applicant's pending claims are not to be limited to products formed by the specific methodologies of applicant's disclosure, but rather are limited only by the limitations expressly recited in the claims appropriately interpreted in accordance with the doctrine of equivalence.

Claim 38 is allowable over the Examiner's said references of Hunt (506) and Fukasawa for the reasons discussed above, and applicant therefore requests formal allowance of claim 38 in the Examiner's next action. Applicant notes that the Examiner has not cited the second Hunt reference (830) against claim 38, but also notes for the record that claim 38 is allowable over any combination of Hunt (506), Fukasawa and Hunt (830) for at least the reason that there is no disclosure or suggestion within or amongst any of

the cited references of a high purity aluminum target diffusion bonded to an aluminum-containing backing plate and having a predominant portion of the grains therein less than 100 microns in maximum dimension.

Claims 39-52 depend from claim 38, and are therefore allowable for at least the reasons discussed above regarding claim 38, as well as for their own recited features which are neither shown nor suggested by the cited references.

Claims 38-52 are allowable for the reasons discussed above, and applicant therefore requests for allowance of claims 38-52 in the Examiner's next action.

Respectfully submitted,

Dated: February 28, 2003 By: ______________________
David G. Latwesen, Ph.D.
Reg. No. 38,533

FAX RECEIVED
FEB 2 8 2003
TECHNOLOGY CENTER 2800

Application Serial No. 09/928,172
Filing Date ....August 9, 2001
Inventor..Chris Parfeniuk et al.
Assignee..Honeywell International Inc.
Group Art Unit..2823
Examiner ....W. M. Brewster
Attorney's Docket No. ....30-5016-(4015) DIV1
Title: Physical Vapor Deposition Target Constructions

VERSION WITH MARKINGS TO SHOW CHANGES MADE ACCOMPANYING RESPONSE TO DECEMBER 4, 2002 OFFICE ACTION

In the Specification

The replacement specification paragraphs incorporate the following amendments. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

The paragraph beginning on line 13 of page 6 is amended as follows:

A method encompassed by the present invention is described by a flow diagram in Fig. 2. At an initial step (labeled 30 in Fig. 2) work hardening is done to ~~the~~ a target material. If, for example, the target material comprises aluminum, work hardening can be introduced by compressing the aluminum from an initial thickness to a second thickness. Such compression is illustrated in Fig. 3, wherein a target 50 is illustrated before and after compression, with an arrow 52 provided to indicate the step of compression. Target 50 comprises a first thickness "X" prior to the compression 52 and a second thickness "Y" after the compression. The compression can be accomplished by, for example, cold forging or cold rolling The final thickness of target 50 ("Y") can be, for example, less than

2% of the initial thickness of target 50 (i.e., a 98% compression), and is typically less than or equal to about 40% of the initial thickness of target 50 (i.e., a 60% compression). In particular embodiments, target 50 can be subjected to a 95% compression (i.e., compressed so that final thickness "Y" is about 5% of initial thickness "X").

The paragraph beginning on line 1 of page 9 is amended as follows:

Assembly 70 ~~is~~ can be formed in, or placed in, an atmosphere which is inert relative to oxide formation from materials of plate 60 and target 50. In embodiments in which plate 60 and target 50 comprise high-purity aluminum, or aluminum alloys, the inert atmosphere can comprise a vacuum, or consist essentially of, for example, one or more of nitrogen gas and argon gas. The inert atmosphere preferably does not comprise oxidative components (like oxygen), as such could adversely cause oxidation of the materials of one or both of the blank 60 and target 50.

The paragraph beginning on line 21 of page 9 is amended as follows:

An exemplary thermal treatment procedure for treating a target and backing plate which comprise aluminum is as follows. Initially, an assembly comprising a target joined against a backing plate is heated to a temperature of from about 280°C to about 400°C (preferably form about 300°C to about 350°C, and more preferably from about 300°C to about 344°C) and maintained at such temperature for a time of from 15 to 30 minutes. The

assembly is then transferred to a forge which is also maintained at a temperature of from about 280°C to about 400°C. The forge is utilized to compress target 50 and backing plate 60 together to a ~~temperature~~ pressure of from about 10,000 psi to about 16,000 psi. After compressing the target and backing plate, the assembly is transferred back to the furnace having a temperature of from about 280°C to about 400°C, and maintained at such temperature for an additional time of from about 10 minutes to about 30 minutes.

In the Claims

No changes are made to the claims.